# REFERENCE 1

Prepared for:

EG&G Idaho, Inc./Westinghouse Idaho Nuclear Company

Idaho Falls, Idaho

Ref: C86-131159, Task 6, Mod 4

# Report for the Chemical Processing Plant Drilling and Sampling Program at Solid Waste Management Unit CPP-51

Prepared by:

Golder Associates Inc.

Redmond/Richland, Washington

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CONSULTING ENGINEERS

REPORT FOR

# THE CHEMICAL PROCESSING PLANT DRILLING AND SAMPLING PROGRAM AT SOLID WASTE MANAGEMENT UNIT CPP-51

REF: C86-131159, TASK 6, MOD 4

Prepared For:

EG&G Idaho, Inc./Westinghouse Idaho Nuclear Company/ID

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Redmond/Richland, WA

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# 1. INTRODUCTION

## 1.1 Purpose and Objectives

The purpose of this investigation is to determine the nature and horizontal extent of PCB contamination suspected to have been released at Solid Waste Management Unit (SWMU) CPP-51.

## 1.2 Organization of the Report

This report presents general information on the site and the physical setting, a description of sampling and analysis procedures, a description of the nature and extent of the contamination, a health and environmental assessment, and a summary and conclusions. Laboratory analytical results are presented in Appendix A.

# 2. SITE BACKGROUND AND PHYSICAL SETTING

## 2.1 Idaho Chemical Processing Plant

### 2.1.1 Regional Geology

The Idaho Chemical Processing Plant (ICPP) is located in the southern portion of the Idaho National Engineering Laboratory (INEL) site that covers approximately 890 square miles of the eastern Snake River Plain in southeastern Idaho (See Figure 2.0). The plain is a structural and topographic basin approximately 200 miles long and 50 to 70 miles wide. Surficial sediments range from 0 to 345 feet thick at the INEL. Underlying the surficial sediments are 2,000 to 10,000 feet of basalt flows, rhyolitic rocks, tephra, and interbedded alluvium and lacustrine deposits (Mundroff et al., 1964; Bartholomay et al., 1989; Pittman et al., 1988).

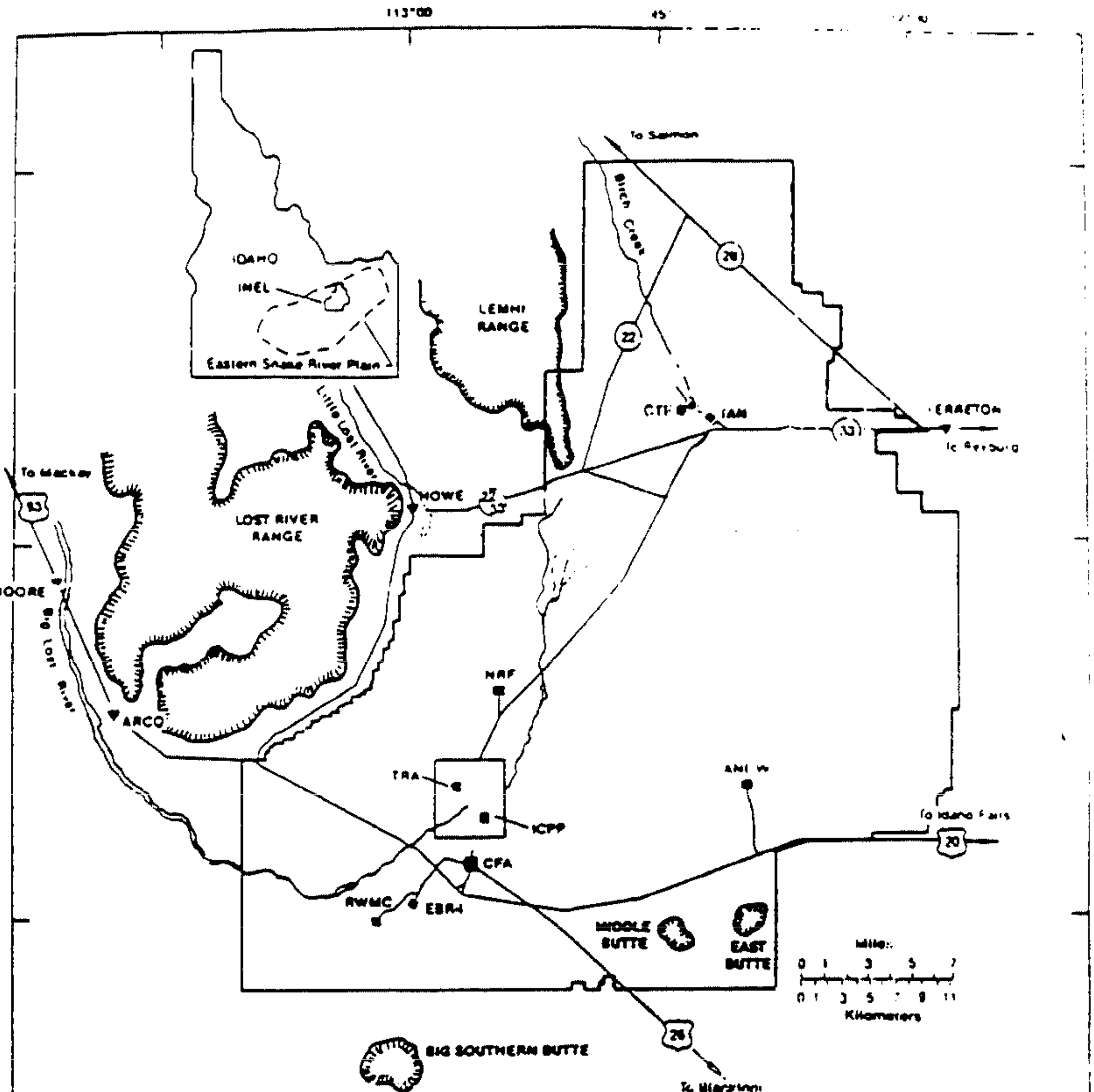
The ICPP is located on alluvial sediments deposited by the Big Lost River or on fill materials. The alluvial sediments are generally composed of sand and gravel with only traces of silt and clay. This coarse grain surficial layer is underlain by up to 10 feet of silt and clay that overlies the Snake River Plain basalts. The contact between the basalt and the overlying sediments generally occurs between 40 to 50 feet below the undisturbed land surface in the area of the ICPP (WINCO, 1989a, 1989b).

Sedimentary interbeds are common within the Snake River Plain basalts. In the area of the ICPP, a 15 to 30 foot thick clayey interbed occurs at a depth of approximately 110 feet below the land surface. The sequence of interbedded basalt and sedimentary interbeds continues well below the water table and there is some evidence of a sedimentary interbed at depth of approximately 750 feet below the land surface (WINCO 1989a, 1989b). Sedimentary interbeds between the basalt flows are primarily composed of sand, silt, and clay sized materials (WINCO 1989a, 1989b). Layers containing cinders within the basalts are composed primarily of sand and gravel-sized material.

### 2.1.2 Regional Hydrogeology

Surface Water Hydrogeology

The Big Lost River is the major surface water feature on the INEL with its headwaters located west of the site. The Big Lost River flows to the southeast past the town of Arco, Idaho onto the Snake River Plain then turns to the northeast flowing onto the INEL and terminating in three playa lakes. As the river flows onto the plain the channel branches into many distributaries and the flow is spread broadly, losing water by infiltration into the channel bottom (Pittman, 1988). The Big Lost River is ephemeral, and flows onto the site only during periods of high runoff. The INEL Diversion Dam located approximately 9 miles upstream from the ICPP, was designed to control flooding on the INEL site by diverting water into designated spreading areas.




EXPLANATION
Selected Facilities at the Idaho National Engineering Laboratory

CFA - CENTRAL FACILITIES AREA
EBR-1 - EXPERIMENTAL BREEDER REACTOR NO. 1
ICPP - IDAHO CHEMICAL PROCESSING PLANT
CTF - CONTAINED TEST FACILITY (formerly called Loss of Fluid Test Facility--LOFT)
NRF - NAVAL REACTORS FACILITY
RWMC - RADIOACTIVE WASTE MANAGEMENT COMPLEX
TAN - TEST AREA NORTH
TRA - TEST REACTORS AREA
ANL-W - ARGONNE NATIONAL LABORATORY-WEST

INEL BOUNDARY
FACILITIES
TOWNS

43°15'

(after Bartholomay, et al. 1989)

FIGURE 2.0
GENERAL INEL SITE MAP
EG&G/ICPP/ID

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Subsurface Hydrogeology

The Snake River Plain aquifer is a vast groundwater reservoir that may contain more than 1 billion acre-feet of water (Barraclough et al., 1981). The groundwater flow direction is generally from north-northeast to the south-southeast. Groundwater flow is through intercrystalline and intergranular pores, fractures, cavities, interstitial voids, interflow zones, and lava tubes. The depth to the Snake River Plain aquifer in the area of the ICPP is approximately 455 feet below land surface, based on 1990 water level measurements made by GAI. The direction and rate of groundwater movement in the vicinity of the ICPP is documented from monitoring contaminant plumes in the Snake River aquifer and is consistent with the regional trend. The rate of flow ranges from 5 to 15 ft/day (Pittman et al., 1988)

Two perched groundwater zones are known to exist at the ICPP. One perched groundwater zone is located at approximately 40 feet below ground surface along the contact between the surficial alluvial sediments and the uppermost Snake River Plain basalt flow. The groundwater is perched by a silty/clayey layer overlying the basalt. The second known perched groundwater zone occurs along the top of a low permeability sedimentary interbed located at approximately 110 feet below land surface. The direction of flow and extent of both of these perched zones is not known.

## 2.2 Solid Waste Management Unit (SWMU) CPP-51

### 2.2.1 Location and Description of SWMU CPP-51

SWMU CPP-51 is an unpaved area located along the west side of the ICPP facility at the northwest corner of the intersection of Birch Street and Ponderosa Avenue. See Figure 2.1.

SWMU CPP-51 was used as a temporary staging area for the storage of transformers and PCB contaminated soil, debris, and concrete resulting from the ICPP Utilities Replacement and Expansion Project.

In 1985, four 2400 volt electric transformers were taken out of service and removed from the transformer yard located near CPP-613 Substation #10. The transformers were placed on plastic sheets in SWMU CPP-51 for temporary staging. The transformers contained polychlorinated biphenyl (PCB) concentrations of 160-400,000 parts per million. Two of the transformers were found leaking onto the plastic from loose valves and fittings during an inspection in July 1985.

In August 1985, approximately 40 drums containing soil, debris, and concrete from the transformer yard were placed in the temporary staging area until disposal could be arranged. The drums and transformers were shipped to a commercial disposal facility (US Pollution Control, Inc., Murray, Utah) in late 1985.

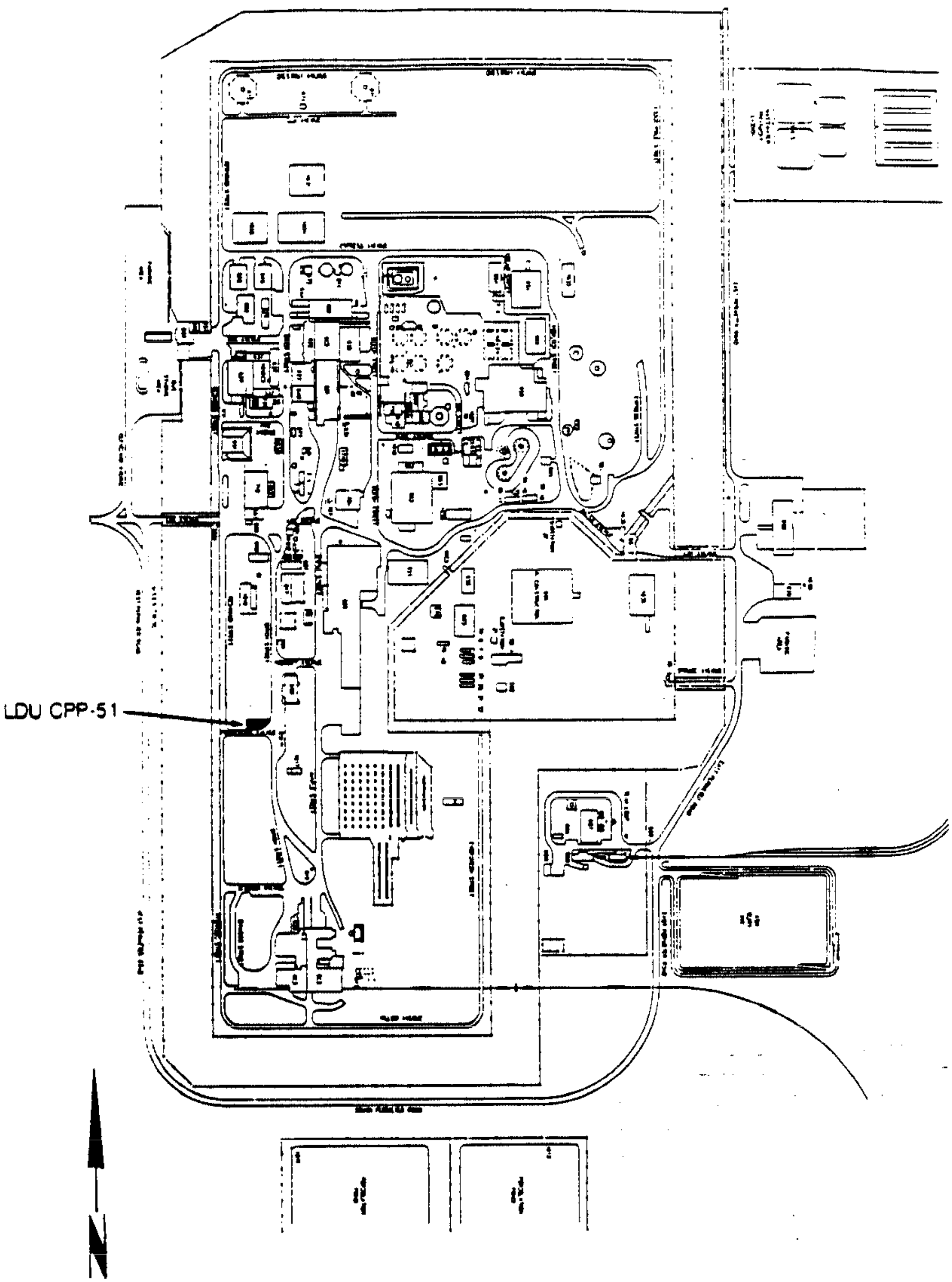


FIGURE **2.1**

**SITE PLAN**

IDAHO CHEMICAL PROCESSING PLANT

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893-1195-350 21938 8/28/90 HP

Leaks and spills from the PCB contaminated materials may have contaminated the soil at the staging area. SWMU CPP-51 includes an area of approximately 5,000 $ft^2$ (100 ft x 50 ft) where soils may have been contaminated. No sampling or soil removal activities were conducted at the unit prior to this investigation.

### 2.2.2 Known or Suspected Wastes Associated with SWMU CPP-51

Wastes associated with SWMU CPP-51 include PCBs and potentially chlorinated benzene solvent carriers such as 1,2,4-trichlorobenzene.

# 3. SAMPLING AND ANALYSIS

## 3.1 Objectives

The objective of the sampling at SWMU CPP-51 is to determine the presence, if any, and nature of hazardous constituents contaminating soils as result of the temporary storage of transformers and PCB containing debris. The sampling program for this preliminary characterization effort is focused on the surface soils because PCB's are very immobile in soils and any contamination present would likely be limited to the surface soils. Sampling of the site was accomplished on June 4 and 5, 1990.

## 3.2 Sampling Methods and Locations

Sampling locations at SWMU CPP-51 are shown on Figure 3.1. Systematic rand-- were collected on 25 x 25 foot grid pattern over the site. A composite sample v from each of the eight areas formed by the grid (areas 1 through 8 on Figure 3. ... composite samples were collected from five randomly selected locations from a 5 x 5 foot grid within each area as shown on Figure 3.1. Surface soil (upper 6 inches) were sampled at each location and the sample split into two aliquots. One aliquot was composited with the other samples from the area, and the other aliquot archived. The archived samples are currently being retained for any subsequent analyses deemed necessary. All sample locations were screened for radiation contamination by a WINCO Health Physicist (HP).

To protect personnel from possible contaminants, an exclusion zone was established around the perimeter of the site. In accordance with the WINCO Construction Safe Work Permit, all personnel inside the exclusion zone were dressed in tyvek worn over personal clothing, cotton glove liners, rubber gloves, boot covers, and full face respirators. Self screening instrumentation for alpha and beta-gamma radiation were made available by the WINCO Health Physicist. All samples were screened by the WINCO HP and no radiation levels above background were detected.

All sampling equipment was decontaminated by Golder Associates personnel prior to .. Decontamination, as specified in Section 5 of the Technical Work Plan (GAI, 1990a), consisted of the following procedures:

- Steam clean equipment with deionized water and wipe dry.
- Wipe equipment with a clean rag soaked with methanol and allow to air dry.
- Rinse equipment with deionized water and wipe dry with clean rag.
- Store equipment in plastic wrapping until needed.

## 3.3 CPP-51 Site Geology

SWMU CPP-51 is located on granular fill materials which probably overlies alluvial sediments deposited by the Big Lost River. No borings other than the shallow hand dug

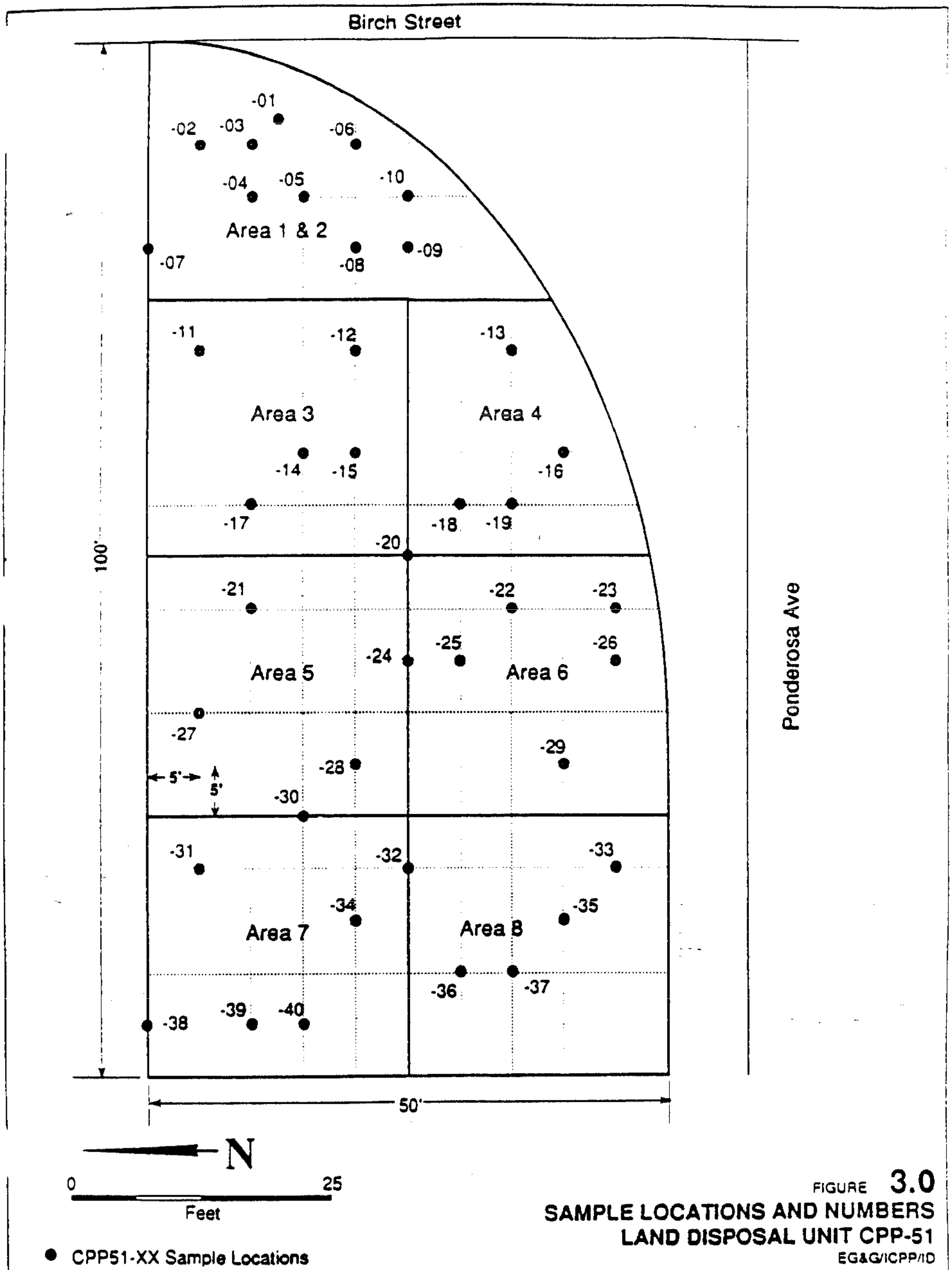


FIGURE 3.0
**SAMPLE LOCATIONS AND NUMBERS**
**LAND DISPOSAL UNIT CPP-51**
EG&G/ICPP/ID

PROJECT NO. 893-1196.350 DWG. NO. 22756 DATE 9/28/90 DRAWN TK

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holes for sample acquisition were completed at the site. Based on the proximity of SWMU CPP-51 to Zone 2 at LDU CPP-64 where three 6 foot deep borings were advanced, the near surface stratigraphy is probably similar. Zone 2 stratigraphy at LDU CPP-64 consisted of a two foot thick bed of sandy to gravelly silt overlying fine to medium SAND to gravelly fine to coarse SAND.

## 3.4 Sample Handling and Analysis, SWMU CPP-51

Surface samples were collected at the locations indicated in Figure 3.1. Samples were obtained from the upper 6 inches with the use of a stainless steel sampling trowel. Two aliquots of samples were collected at each location and labeled in accordance with the QAPP (GAI,1990a). The sample aliquots were transferred to the sample processing area and one sample was labeled as an archive sample and the other was used to prepare the composite sample for each of the eight sections as shown on Figure 3.1. After collection each sampling location was surveyed by the WINCO Health Physicist for beta/gamma activity. The results of the survey were recorded in the field data book by the Lead Geologist.

The composite sample for each section was prepared by placing approximately 200 grams of sample from each discrete aliquot into a decontaminated stainless steel bowl. After weighing all the aliquots the sample was mixed thoroughly with decontaminated stainless steel utensils. A sub-sample was transferred into a 4 ounce glass sample jar and sealed with a teflon lined cap. The samples were labeled and placed into an appropriate shipping container with the necessary amount of coolant for maintaining the samples at 4°C. The samples were then transferred under chain-of-custody to the contract laboratory by overnight mail.

The tools used to collect the samples were decontaminated before and after sampling was begun at sections 1 and 2. At sections 3 through 8, the stainless steel sample collection tools were decontaminated between each sampling site within the individual sections. The stainless steel sample preparation tools were decontaminated after processing each sample composite. All decontamination was performed as described in Section 3.2.

Upon the completion of sampling activities for each day, all solid soil wastes generated were double packaged according to WINCO waste handling practices and removed from the site for disposal in accordance with INEL waste disposal procedures. All liquid wastes generated from the final decontamination of sample processing equipment were collected in a catch basin and allowed to evaporate. Sample material remaining from the preparation of the soil composites was returned to SWMU CPP-51 and spread evenly over the sampling area.

All the composite samples obtained from SWMU CPP-51 were analyzed for PCBs by EPA Method 8080 at Pacific Northwest Environmental Laboratory, Inc. (PNELI) of Redmond, Washington. Results of the analysis indicating the target compounds detected are presented in Table 4.1. Copies of all laboratory data reports are provided in Appendix A. A discussion of the analytical results is presented in Section 4.

## 3.5 Quality Assurance/Quality Control

Quality control procedures implemented during the sample collection and analysis portion of the program consisted of:

- The collection and analysis of equipment blanks and field blank samples for monitoring of potential contamination introduced from the sample containers and equipment decontamination process;
- The collection and analysis of matrix spike and matrix spike duplicate samples for the measurement of overall field and laboratory precision and accuracy;
- The preparation and analysis of blind reference samples for PCBs;
- The analysis of method blank samples by the contract laboratory as part of the laboratory's internal quality assurance program.

### 3.5.1 Blanks

An equipment blank was submitted for PCB analysis and the contract laboratory performed analyses on method blanks as part of their internal quality assurance program. Results of all the blank analyses indicate no PCB compounds were detected at detection limits ranging from 0.5 to 1.0 ug/L in water and from 10 to 20 ug/Kg in soil.

The equipment blank was prepared by decontaminating the sample processing equipment as described in Section 5 of the Technical Work Plan (GAI, 1990a), followed by a final rinse with deionized water and collection of the rinseate in the proper containers for PCB analyses.

### 3.5.2 Matrix Spikes and Matrix Spike Duplicates

Samples for matrix spike and matrix spike duplicate analysis were collected from the composite prepared for sample Area 2 (See Figure 3.1). The samples were spiked at the laboratory with Arochlor 1254 at a concentration of 350 ug/Kg. The results indicate percent recoveries of 131 and 140 were obtained with a precision of 6.5 percent relative percent difference. No target precision and accuracy limits are established in the reference methods but generally a limit of $\pm$25% is established for assessment of precision and accuracy. Though the recovery limit is exceeded no action is recommended according to the data validation functional guidelines. Furthermore, based on surrogate recoveries, calibration checks, and overall system performance, the high recoveries do not affect the usability nor validity of the data.

### 3.5.3 Sample Collection Systems Audit

Field sampling activities were audited on June 21, 1990 as part of a comprehensive quality assurance program audit conducted in compliance with the GAI QA Program Plan for INEL Support Services, (GAI, 1990b). Audit results indicated that procedures identified in Volume II of the site Technical Work Plan (GAI, 1990a) were being implemented properly; no observations or findings were made that related to the integrity of sample analytical data.

## 3.6 Data Validation

All samples analysis results were reviewed and validated in accordance with Section 8 of the Technical Work Plan, Volume II - Quality Assurance Project Plan (GAI, 1990a) and with the EPA data validation guidelines (EPA 1988a and 1988b). The following is an explanation regarding the data validation performed and any anomalies noted.

All the soil samples to be analyzed were extracted within 7 to 14 days. Holding times for organic analyses in soils have not been established but the latest proposed update to SW-846 recommends all soils, sediments and sludges that are to be analyzed for semivolatile organics, pesticides and PCBs be extracted within 14 days (EPA 1987). The samples were collected on June 4 and 5, 1990, received at the laboratory on June 6, 1990, and extracted on June 12 and 15, 1990.

The laboratory performed the proper instrument calibration as required by the reference methodology. The calibration data was reviewed against all the raw data submitted and all recalculated values verified acceptably.

A review of all laboratory method blanks performed in the usual sequence of analyses indicate no evidence of laboratory contamination nor instrumentation problems.

The laboratory added surrogate compounds to all of the samples prior to sample preparation as a measure of the extraction efficiency. Surrogate recoveries ranged from 88 to 124 percent which is within the method QC requirements of 76 to 150 percent.

# 4. NATURE AND EXTENT OF CONTAMINATION

## 4.1 Results of Analytical Analysis

Table 4-1 presents the analytical results from the eight composite samples collected at SWMU CPP-51. Supporting laboratory reports are provided in Appendix A. All seven of the CERCLA target PCB compounds were analyzed. Arochlor 1260 was the only PCB detected in the samples at concentrations ranging from 0.068 to 0.120 mg/Kg.

Currently, there are no action levels or cleanup standards promulgated for PCBs by the Resource Conservation and Recovery Act (RCRA). However, cleanup levels have been established under the Toxic Substances Control Act (TSCA). Under TSCA two categories of cleanup have been established that may be appropriate for SWMU CPP-51; one for areas having restricted access and a second category for nonrestricted access. Restricted areas are defined as "areas other than electrical substation that are at least 0.1 km. from a residential/commercial area and limited by man-made barriers (e.g., fences and walls) or substantially limited by naturally occurring barriers such as mountains, cliffs, or rough terrain. These areas generally include industrial facilities and extremely remote rural locations" (40 CFR 761.123).

The cleanup standards as cited in 40 CFR 761.125 Subpart G-PCB Spill Cleanup Policy are 25 ppm PCB's in restricted access areas and 10 ppm in nonrestricted access areas (provided that soil is excavated to a minimum depth of 10 inches and backfilled with clean soil i.e, less than 1 ppm PCBs).

All analytical results from the eight composite samples tested were below cleanup levels for PCB's in both restricted and nonrestricted access areas. Assuming that five times the highest recorded composite sample reading, i.e., 5 x 0.12 ppm = 0.6 ppm, is the maximum level of any one discrete sample, this level is still less than 1 ppm and well below cleanup standards. The analytical results of the soil sampling program are presented in Table 4.1; sample locations are shown on Figure 3.1. Copies of all laboratory reports are provided in Appendix A.

TABLE 4-1

PCB SAMPLE ANALYSIS RESULTS LAND DISPOSAL UNIT CPP-51

| Composite Sample Location Area | Results in mg/Kg (ppm) PCB-1260 |
|---|---|
| 1 | .078 |
| 2 | .120 |
| 3 | .068 |
| 4 | .110 |
| 5 | .100 |
| 6 | .120 |
| 7 | .080 |
| 8 | .077 |

Note: Composite sample locations are shown on Figure 3.1.

# 5. HEALTH AND ENVIRONMENTAL ASSESSMENT

The Health and Environmental Assessment (HEA) is conducted to evaluate the impact of hazardous constituents present at a site. The HEA involves identifying the constituents of concern, the concentrations of these compounds in the affected environmental media, and exposed or potentially exposed human or environmental receptors. The essential element of this assessment is the development of an appropriate set of health and environmental criteria to which the measured or predicted concentrations of toxic contaminants are compared. These criteria are primarily based on EPA-established chronic-exposure limits. When the criteria are exceeded, there is a likelihood of adverse health or environmental effects and additional measures may be required to prevent or reduce these effects.

This HEA evaluates potential impacts associated with chemicals detected in the previously described sampling program for SWMU CPP-51.

## 5.1 Identification of Toxic Contaminants

Analyses of composite surface soil samples at SWMU CPP-51 were conducted to determine the presence and concentration of PCBs. The only potential contaminant identified is PCB-1260 (See Table 4-1). The PCB concentrations detected in all samples are significantly less than current regulatory soil clean-up guidelines 40 CFR 761. However, because of the high public awareness of PCBs and concern over exposure to these compounds, a brief evaluation of the levels detected at SWMU CPP-51 is presented. It should be noted that the perceived hazards associated with exposure to PCBs may far outweigh documented human toxicity.

PCBs are very stable materials that contain 12 - 68% chlorine and are extremely persistent in the environment. All PCBs are mixtures of chlorinated congeners, but the exact nature and toxicity of these mixtures is unknown. PCBs vary in their potency for producing biological effects, but little is known about which congeners may be responsible for the effects and to what extent the effects occur in humans. PCBs concentrate in fat tissue and nearly all persons have detectable levels in their fat. Chronic toxicity studies in animals have suggested that PCBs can cause respiratory tract impairment, neurotoxicity, liver damage, birth defects, and cancer. Human studies indicate that skin irritation can occur following both acute and chronic exposures. The primary dermal effect is a severe and disabling form of acne called chloracne. There is inadequate but suggestive evidence that PCBs may also cause liver cancer in humans by all routes of exposure. There is no conclusive evidence that PCBs cause cancer in humans, but the EPA has classified PCBs as a B2, probable human carcinogen (EPA 1990a).

## 5.2 Identification of Exposure Pathways

Exposure to PCBs can occur from inhaling PCB-contaminated particulates, dermal absorption, or ingestion of contaminated food, soil, or water. Because of the industrial location of the SWMU CPP-51 and the very low PCB soil concentrations, it is unlikely that any exposure routes other than those associated with access to the immediate area are appropriate. Therefore, the exposure routes evaluated for this HEA are those associated with occupational activities and include incidental soil ingestion, inhalation of potentially contaminated PCB particulate, and dermal absorption of the compound from contact with the soil at SWMU CPP-51.

## 5.3 Identification of Receptor Populations

The receptor population for exposure to potential PCB contamination at SWMU CPP-51 is adult workers at ICPP with access to the area. It is assumed that such access or duties in the immediate area would be minimal since the site is not actively used for daily or routine operations.

## 5.4 Human Health Assessment

The possible human health effects from exposure to the low levels of PCBs detected in the soil at SWMU CPP-51 are assessed in this section. The PCB intakes from incidental ingestion of soil, inhalation of contaminated particulate, and dermal absorption from soil contact are calculated and the estimated risks associated with these intakes are presented. The results of this assessment are summarized in Table 5-1.

General assumptions used in this assessment include:

1. The maximum detected PCB soil concentration is used to determine all intakes and corresponding risks. This assumption is conservative and may overestimate the actual intake.

2. The potential for acute toxicity does not exist because the PCBs are present only in a soil matrix and were detected at very low levels. It is assumed that the chronic toxicity is limited to carcinogenicity.

3. The exposure frequency for all pathways is assumed to be 14% (52 days/yr) or one working day per week based on best professional judgement. Access or duties in the immediate area are assumed to be minimal since the site is not actively used for daily or routine operations.

4. Soil ingestion is assumed to occur incidental to working in an outdoor environment. PCB intake from soil ingestion is calculated using the EPA recommended intake equations (EPA 1989)

$$\text{Intake (mg/kg/day)} = \frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where: CS = PCB concentration in soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
CF = Conversion Factor ($10^{-6}$ kg/mg)
FI = Fraction ingested from contaminated source (unitless)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight
AT = Averaging Time

Upperbound exposure parameters as recommended by USEPA Region 10 (EPA 1990b) are used in all intake calculations except for exposure frequency which is modified by best professional judgement. These apply protective assumptions and may result in higher exposure levels than may actually occur. These parameters are:

CS = 0.120 mg/kg (Maximum detected)
IR = 100 mg/day
FI = 100%
EF = 52 days/year
ED = 40 years
BW = 70 kg
AT = 365 days x 75 years

5. The intake from inhalation of PCB contaminated particulate is conservatively estimated using the national ambient air quality standard for annual average concentrations of total suspended particulate of 75 ug/m$^3$. It is assumed that 25% or 19 ug/m$^3$ is respirable, and that the PCB concentration in the airborne particulates corresponds to the fraction of PCB in the soil. The intake from inhalation is calculated using the recommended EPA inhalation intake equation (EPA 1989):

$$\text{Intake (mg/kg/day)} = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$$

Where: CA = PCB concentration in air (mg/m$^3$)
IR = Inhalation Rate (m$^3$/day)
ET = Exposure Time (hours)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight
AT = Averaging Time

The parameters used for air intake calculations are:

CA = 2.3E-09 mg/m$^3$ (Calculated)
IR = 30 m$^3$/day
ET = 4 hours/day
EF = 52 days/year
ED = 40 years
BW = 70 kg

AT = 365 days x 75 years

The inhalation rate parameter is the upperbound residential inhalation rate since the upperbound industrial inhalation rate is considered inappropriate (Sweeney, C., EPA-Region X, (Personal Communication, June 7, 1990). The exposure time and frequency are based on best professional judgement. The remaining parameters are EPA recommended upperbound exposure parameters (EPA 1990b).

6. The absorbed dermal dose from exposure to soil potentially contaminated with PCB is calculated using the EPA recommended equation (EPA, 1989):

$$\text{Absorbed Dose (mg/kg/day)} = \frac{CS \times CF \times SA \times AF \times AB \times EF \times ED}{BW \times AT}$$

Where:
CS = PCB concentration in soil (mg/kg)
CF = Conversion Factor ($10^{-6}$ kg/mg)
SA = Surface area of the hands ($cm^2$)

AF = Adherence Factor ($mg/cm^2$)
AB = Chemical specific absorption factor
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight
AT = Averaging Time

The limited availability of information regarding dermal absorption of chemicals requires that many of the parameters must be estimated. It is assumed that exposed individuals will only have soil contact with their hands one workday a week (exposure frequency of 52 days/yr). The adherence factor is calculated as the upper 95 percent confidence limit for adherence of unsieved soil (Driver et al. 1989). To estimate the dermal absorption of PCBs an absorption factor is derived based on the contact time of the soil with the skin (time between exposure and washing) and the bioavailability of the chemical from a soil matrix. The contact time is conservatively assumed to be 8 hours and 80 percent of the contaminant is estimated to be absorbed during this period (Shu et al., 1988). PCBs are assumed to be 10 percent bioavailable from soil (Ryan et al. 1987). Thus, the estimated absorption factor for PCBs (contact time x soil bioavailability) is 8 percent. The remaining parameters are EPA recommended upperbound exposure parameters (EPA, 1990b; EPA 1989). Thus,

CS = 0.120 mg/kg (Maximum detected)
SA = 820 $cm^2$
AF = 0.7 $mg/cm^2$
AB = 8%
EF = 52 days/year
ED = 40 years
BW = 70 kg
AT = 365 days x 75 years

The estimated intakes and the associated risks for each exposure pathway considered in this HEA are summarized in Table 5-1. The estimated risk of exposure is calculated by multiplying the intake by the slope factor for PCB. The slope factor converts daily intakes averaged over a lifetime of exposure directly to the estimated incremental risk of an individual developing some form of cancer. This risk estimate is an upperbound estimate based on the upper 95th percent confidence limit and one can be reasonably confident that the actual risk is less than that predicted. An increased cancer risk in the range E-06 to E-04 is generally considered acceptable by EPA in the National Contingency Plan (40 CFR 300.430).

The risk associated with ingesting soil with PCBs at the low level detected at SWMU CPP-51 is 1E-07. This type of ingestion is usually the result of hand to mouth activity such as smoking, eating, or other incidental ingestion.

The inhalation of PCB contaminated particulates can be an important occupational exposure. However, using very conservative assumptions and assuming that all respirable particulate is contaminated at levels corresponding to soil PCB concentrations, the estimated air concentration of PCB is 2.3E-09 $mg/m^3$. The cancer risk associated with the inhalation exposure scenario is 8E-11. The National Institute for Occupational Safety and Health (NIOSH) recommendation for an occupational air exposure limit is 0.001 $mg/m^3$ because of the potential for cancer development with PCB exposure. This limit is the minimum reliably detectable concentration using the recommended sampling and analytical methods. It should also be noted that chloracne, a non-carcinogenic effect, does not appear to occur at concentrations below 0.1 $mg/m^3$ (Proctor et al., 1988). Thus, predicted air concentrations are significantly less than recommended limits or limits recognized to produce adverse effects.

The dermal absorption of PCBs present in the soils at SWMU CPP-51 is also associated with negligible risk. The estimated risk for this pathway is 5E-08 and may actually be less because of the conservative assumptions used.

Thus, the cancer risk to workers occupationally exposed to the PCBs at the concentrations detected in soil samples from SWMU CPP-51 is insignificant. As noted previously, the PCB soil concentrations are well below the current regulatory soil clean up guidelines (40 CFR 761.125, Subpart G). Although non-carcinogenic effects can also occur from PCB exposure, the EPA does not currently publish a chronic oral or inhalation reference dose to quantitatively evaluate these systemic effects (EPA 1990b). Human exposures to chemical contaminants in the environment are typically limited by the potential for carcinogenic effects. In general, exposure levels that are not of concern from a carcinogenic standpoint are well below levels that will result in non-carcinogenic, systemic health effects. Based on existing literature, this seems to apply in the case of PCBs. However, human reproductive effects resulting from exposure to low concentrations of PCBs are still under investigation.

### 5.5 Environmental Assessment

SWMU CPP-51 is located within the controlled boundaries of the ICPP. The area is an industrial area with limited access. The area does not support crops or plants that may accumulate PCBs for transport in the food chain. Large animals and migratory wildlife do not have access to or are not known to frequent this immediate area. Thus, bioaccumulation in terrestrial animals is unlikely.

The low concentrations of PCBs present at SWMU CPP-51 are not expected to affect any surface or groundwater system. The limited mobility of PCBs in the soil, low solubility in water, and the depth to groundwater at the ICPP would appear to preclude the transport of PCBs to the groundwater. Transport of PCBs through surface runoff would also be negligible because of the low concentrations present in the soil and the limited runoff that might occur from this area. Thus, significant transport of PCBs from SWMU CPP-51 to water systems and eventual bioaccumulation by aquatic species is unlikely.

Finally, the vaporization of PCBs or airborne transport of particulates in significant quantities from this area is not expected because of the extremely low vapor pressure of PCBs, the low concentrations detected in the soil, and the small areal extent of SWMU CPP-51.

TABLE 5-1

SUMMARY OF HEALTH AND ENVIRONMENTAL ASSESSMENT FOR PCB EXPOSURE AT SWMU CPP-51

| PARAMETER | INGESTION EXPOSURE | INHALATION EXPOSURE | DERMAL EXPOSURE |
|---|---|---|---|
| Slope Factor | 7.7 $(mg/kg/d)^{-1}$ (a) | 7.7 $(mg/kg/d)^{-1}$ (b) | 8.6 $(mg/kg/d)^{-1}$ (c) |
| Chronic Intake(d) | 1.3 E-08 mg/kg/d | 1E-11 mg/kg/d | 6E-09 mg/kg/d |
| Cancer Risk | 1E-07 | 8E-11 | 5E-08 |
| Cumulative Cancer Risk (All pathways): 1E-07 | | | |

(a)EPA 1990b
(b)Assumed equivalent to oral slope factor
(c)Slope factor adjusted for absorption
(d)All intakes based on maximum detected PCB soil concentration of 0.12 mg/kg

# 6. SUMMARY AND CONCLUSIONS

This section presents a summary of the results of the investigation at SWMU CPP-51. Conclusions regarding the nature and extent of contamination detected and potential health or environmental effects associated with the contamination detected are presented and recommendations for additional investigations or corrective measures are also presented.

## 6.1 Summary

Forty surface samples were collected at a depth of 6 inches at SWMU CPP-51 (See Figure 4.1). From these 40 samples, 8 composites were prepared from the samples associated with the areas indicated on Figure 3.1. The composite samples were submitted to the contract laboratory for analysis for polychlorinated biphenyl (PCBs).

Results of the sampling and analysis are summarized below:

- Arochlor 1260 was the only PCB detected in the composite sample at concentrations ranging from 0.068 to 0.120 ppm. These concentrations are well below the current regulatory soil clean-up guidelines as presented in Section 4.1.

- The cumulative cancer risk posed by the maximum PCB levels detected is 1E-07, which is below the generally acceptable risk of 1E-06 to 1E-04.

- Results of the environmental assessment of SWMU CPP-51 indicate that the low concentrations of PCBs detected will not affect the local surface or groundwater system. The transport of PCBs from SWMU CPP-51 to water systems with eventual bioaccumulation in aquatic species is unlikely due to the limited mobility of PCBs in soil and negligible surface runoff in the area.

## 6.2 Conclusions

The low concentrations of PCBs identified in soils at SWMU CPP-51 do not pose a significant cancer risk. Given the detected concentrations and the operative occupational exposure pathways, PCBs at SWMU CPP-51 will not pose a risk of systemic health effects to site workers. As a result of the analytical results, the environmental assessment, and the above conclusions on human health effects there is no need to conduct additional investigations at this site and removal, decontamination or closure as a land disposal facility under RCRA is not justified.

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# APPENDIX A

# LABORATORY CHEMICAL ANALYSIS RESULTS

PACIFIC NORTHWEST
ENVIRONMENTAL
LABORATORY

## PCBs ORGANICS ANALYSIS DATA SHEET

| | | | |
|---|---|---|---|
| **PNEL Sample ID.:** | 2467-30 | **Client No.:** | 30-891206 |
| **Client Sample ID.:** | CPPS1-01-P | **Sample Matrix:** | Soil |
| **Date Sample Received:** | 06-06-90 | **Date Sample Analyzed:** | 06-20-90 |
| **Date Sample Extracted:** | 06-15-90 | | |

| *CAS No.* | *Compound* | *Concentration Units: µg/kg* | *Q* |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 10 | U |
| 11104-28-2 | Aroclor - 1221 | 10 | U |
| 11141-16-5 | Aroclor - 1232 | 10 | U |
| 53469-21-9 | Aroclor - 1242 | 10 | U |
| 12672-29-6 | Aroclor - 1248 | 10 | U |
| 11097-69-1 | Aroclor - 1254 | 21 | U |
| 11096-82-5 | Aroclor - 1260 | 78 | |

% DBC surrogate recovery: 115

\PCB-2467

001005

**PACIFIC NORTHWEST**
**ENVIRONMENTAL**
**LABORATORY**

## PCBs ORGANICS ANALYSIS DATA SHEET

**PNEL Sample ID.:** 2467-36
**Client Sample ID.:** CPP51-02-P
**Date Sample Received:** 06-06-90
**Date Sample Extracted:** 06-15-90

**Client No.:** 30-891206
**Sample Matrix:** Soil
**Date Sample Analyzed:** 06-20-90

| *CAS No.* | *Compound* | *Concentration Units: µg/kg* | *Q* |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 10 | U |
| 11104-28-2 | Aroclor - 1221 | 10 | U |
| 11141-16-5 | Aroclor - 1232 | 10 | U |
| 53469-21-9 | Aroclor - 1242 | 10 | U |
| 12672-29-6 | Aroclor - 1248 | 10 | U |
| 11097-69-1 | Aroclor - 1254 | 21 | U |
| 11096-82-5 | Aroclor - 1260 | 120 | |

% DBC surrogate recovery: 88

\PCB-2467

0010006

PACIFIC NORTHWEST
ENVIRONMENTAL
LABORATORY

PCBs ORGANICS ANALYSIS DATA SHEET

| | | | |
|---|---|---|---|
| **PNEL Sample ID.:** | 2467-45 | **Client No.:** | 30-891206 |
| **Client Sample ID.:** | CPP51-03-P | **Sample Matrix:** | Soil |
| **Date Sample Received:** | 06-06-90 | **Date Sample Analyzed:** | 06-20-90 |
| **Date Sample Extracted:** | 06-15-90 | | |

| CAS No. | Compound | Concentration Units: µg/kg | Q |
|---|---|---|---|
| 12674-11-2 | Arôclor - 1016 | 10 | U |
| 11104-28-2 | Aroclor - 1221 | 10 | U |
| 11141-16-5 | Aroclor - 1232 | 10 | U |
| 53469-21-9 | Aroclor - 1242 | 10 | U |
| 12672-29-6 | Aroclor - 1248 | 10 | U |
| 11097-69-1 | Aroclor - 1254 | 21 | U |
| 11096-82-5 | Aroclor - 1260 | 68 | |

% DBC surrogate recovery: 89

\PCB-2467

001008

PACIFIC NORTHWEST
ENVIRONMENTAL
LABORATORY

## PCBs ORGANICS ANALYSIS DATA SHEET

| | | | |
|---|---|---|---|
| **PNEL Sample ID.:** | 2467-51 | **Client No.:** | 30-891206 |
| **Client Sample ID.:** | CPP51-04-P | **Sample Matrix:** | Soil |
| **Date Sample Received:** | 06-06-90 | **Date Sample Analyzed:** | 06-20-90 |
| **Date Sample Extracted:** | 06-15-90 | | |

| *CAS No.* | *Compound* | *Concentration Units: µg/kg* | *Q* |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 11 | U |
| 11104-28-2 | Aroclor - 1221 | 11 | U |
| 11141-16-5 | Aroclor - 1232 | 11 | U |
| 53469-21-9 | Aroclor - 1242 | 11 | U |
| 12672-29-6 | Aroclor - 1248 | 11 | U |
| 11097-69-1 | Aroclor - 1254 | 21 | U |
| 11096-82-5 | Aroclor - 1260 | 110 | |

% DBC surrogate recovery: 101

\PCB-2467

PACIFIC NORTHWEST
ENVIRONMENTAL
LABORATORY

## PCBs ORGANICS ANALYSIS DATA SHEET

| | | | |
|---|---|---|---|
| **PNEL Sample ID.:** | 2467-12 | **Client No.:** | 30-891206 |
| **Client Sample ID.:** | CPP51-6-P | **Sample Matrix:** | Soil |
| **Date Sample Received:** | 06-06-90 | **Date Sample Analyzed:** | 06-20-90 |
| **Date Sample Extracted:** | 06-15-90 | | |

| *CAS No.* | *Compound* | *Concentration Units: µg/kg* | *Q* |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 11 | U |
| 11104-28-2 | Aroclor - 1221 | 11 | U |
| 11141-16-5 | Aroclor - 1232 | 11 | U |
| 53469-21-9 | Aroclor - 1242 | 11 | U |
| 12672-29-6 | Aroclor - 1248 | 11 | U |
| 11097-69-1 | Aroclor - 1254 | 21 | U |
| 11096-82-5 | Aroclor - 1260 | 120 | |

% DBC surrogate recovery: 114

\PCB-2467

PACIFIC NORTHWEST
ENVIRONMENTAL
LABORATORY

## PCBs ORGANICS ANALYSIS DATA SHEET

PNEL Sample ID.: 2467-18
Client Sample ID.: CPP51-7-P
Date Sample Received: 06-06-90
Date Sample Extracted: 06-15-90

Client No.: 30-891206
Sample Matrix: Soil
Date Sample Analyzed: 06-20-90

| CAS No. | Compound | Concentration Units: µg/kg | Q |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 11 | U |
| 11104-28-2 | Aroclor - 1221 | 11 | U |
| 11141-16-5 | Aroclor - 1232 | 11 | U |
| 53469-21-9 | Aroclor - 1242 | 11 | U |
| 12672-29-6 | Aroclor - 1248 | 11 | U |
| 11097-69-1 | Aroclor - 1254 | 21 | U |
| 11096-82-5 | Aroclor - 1260 | 80 | |

% DBC surrogate recovery: 112

\PCB-2467

**PACIFIC NORTHWEST ENVIRONMENTAL LABORATORY**

# PCBs ORGANICS ANALYSIS DATA SHEET

| | | | |
|---|---|---|---|
| **PNEL Sample ID.:** | 2467-24 | **Client No.:** | 30-891206 |
| **Client Sample ID.:** | CPP51-8-P | **Sample Matrix:** | Soil |
| **Date Sample Received:** | 06-06-90 | **Date Sample Analyzed:** | 06-20-90 |
| **Date Sample Extracted:** | 06-15-90 | | |

| *CAS No.* | *Compound* | *Concentration Units: µg/kg* | *Q* |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 11 | U |
| 11104-28-2 | Aroclor - 1221 | 11 | U |
| 11141-16-5 | Aroclor - 1232 | 11 | U |
| 53469-21-9 | Aroclor - 1242 | 11 | U |
| 12672-29-6 | Aroclor - 1248 | 11 | U |
| 11097-69-1 | Aroclor - 1254 | 21 | U |
| 11096-82-5 | Aroclor - 1260 | 77 | |

% DBC surrogate recovery: 124

\PCB-2467

PACIFIC NORTHWEST
ENVIRONMENTAL
LABORATORY

Equipment Blank

PCBs ORGANICS ANALYSIS DATA SHEET

PNEL Sample ID.: 2467-39
Client Sample ID.: CPP51-02-EB
Date Sample Received: 06-06-90
Date Sample Extracted: 06-12-90

Client No.: 30-891206
Sample Matrix: Water
Date Sample Analyzed: 06-20-90

| CAS No. | Compound | Concentration Units: µg/l | Q |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 0.5 | U |
| 11104-28-2 | Aroclor - 1221 | 0.5 | U |
| 11141-16-5 | Aroclor - 1232 | 0.5 | U |
| 53469-21-9 | Aroclor - 1242 | 0.5 | U |
| 12672-29-6 | Aroclor - 1248 | 0.5 | U |
| 11097-69-1 | Aroclor - 1254 | 1.0 | U |
| 11096-82-5 | Aroclor - 1260 | 1.0 | U |

% DBC surrogate recovery: 117

\PCB-2467

0010007

**PACIFIC NORTHWEST**
**ENVIRONMENTAL**
**LABORATORY**

Laboratory Blank

PCBs ORGANICS ANALYSIS DATA SHEET

| | | | |
|---|---|---|---|
| PNEL Sample ID.: | 2467-MB | Client No.: | 30-891206 |
| Client Sample ID.: | NA | Sample Matrix: | Soil |
| Date Sample Received: | NA | Date Sample Analyzed: | 06-19-90 |
| Date Sample Extracted: | 06-15-90 | | |

| CAS No. | Compound | Concentration Units: ug/kg | Q |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 10 | U |
| 11104-28-2 | Aroclor - 1221 | 10 | U |
| 11141-16-5 | Aroclor - 1232 | 10 | U |
| 53469-21-9 | Aroclor - 1242 | 10 | U |
| 12672-29-6 | Aroclor - 1248 | 10 | U |
| 11097-69-1 | Aroclor - 1254 | 20 | U |
| 11096-82-5 | Aroclor - 1260 | 20 | U |

% DBC surrogate recovery: 109

\PCB-2467

**PACIFIC NORTHWEST ENVIRONMENTAL LABORATORY**

Laboratory Blank

PCBs ORGANICS ANALYSIS DATA SHEET

| | | | |
|---|---|---|---|
| **PNEL Sample ID.:** | 2467-MB | **Client No.:** | 30-891206 |
| **Client Sample ID.:** | NA | **Sample Matrix:** | Water |
| **Date Sample Received:** | NA | **Date Sample Analyzed:** | 06-19-90 |
| **Date Sample Extracted:** | 06-12-90 | | |

| CAS No. | Compound | Concentration Units: µg/l | Q |
|---|---|---|---|
| 12674-11-2 | Aroclor - 1016 | 0.5 | U |
| 11104-28-2 | Aroclor - 1221 | 0.5 | U |
| 11141-16-5 | Aroclor - 1232 | 0.5 | U |
| 53469-21-9 | Aroclor - 1242 | 0.5 | U |
| 12672-29-6 | Aroclor - 1248 | 0.5 | U |
| 11097-69-1 | Aroclor - 1254 | 1.0 | U |
| 11096-82-5 | Aroclor - 1260 | 1.0 | U |

% DBC surrogate recovery: 122

\PCB-2467

REFERENCE 2

# TRACK-1 RISK EVALUATION SUMMARY

**DATE:** 1/24/92

**SITE:** CPP-51

**SUMMARY:**

A track-1 assessment was conducted to establish risk-based soil screening concentrations to evaluate PCBs contamination at CPP-51. The dimensions of the contaminated region evaluated in the track-1 assessment are: 19.8 m wide and 30.5 m long, with a depth of 0.61 m. Toxicity data for Aroclor-1260 was used in the evaluation of PCBs. PCBs are classified by the EPA as B2 probable human carcinogens.

The calculation of soil screening concentrations was based on a target risk level representing a hazard quotient of 1 (based on noncarcinogenic effects) or a cancer risk of 1.0E-06 (based on carcinogenic effects). The evaluation followed the track-1 guidance for the assessment of low probability hazard sites at the INEL (DOE/ID-10340(91)).

A summary table of risk-based soil screening concentrations for PCBs is attached. Soil screening concentrations were calculated for both industrial and residential scenarios. The residential scenario considers exposures to individuals living at the site under contaminant conditions that would exist in 100 years (after institutional control). Two potential exposure pathways were evaluated, as applicable to PCBs and based on the availability of toxicity values: soil ingestion and groundwater ingestion (for residential scenario only).

The shaded box in the attached tables shows the lowest risk-based soil concentration for PCBs. The ingestion of groundwater pathway provided the most significant risk (lowest risk-based screening soil concentration) for PCBs.

SUMMARY TABLE OF RISK-BASED SOIL SCREENING CONCENTRATIONS FOR
CPP-51 SOIL CONTAMINATION FOR PCBs (AROCLOR-1260)

| Exposure | Scenarios | | | |
|---|---|---|---|---|
| | Occupational | | Residential | |
| Pathways | Soil Concentration at 1E-06 Risk (mg/kg) | Soil Concentration at HQ = 1 (mg/kg) | Soil Concentration at 1E-06 Risk (mg/kg) | Soil Concentration at HQ = 1 (mg/kg) |
| Soil Ingestion | 7.40E-01 | -- | 8.31E-02 | -- |
| Inhalation of Fugitive Dust | -- | -- | -- | -- |
| Inhalation of Volatiles | NA | NA | NA | NA |
| Groundwater Ingestion | NA | NA | 4.86E-02 | -- |

NA = Not Applicable.
-- = Calculation not performed because of no published toxicity value.
Shaded box = Lowest risk-based soil concentration.